

Magnetic connectivity and photoelectrons in the Venus plasma environment

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Abstract

We present a preliminary study of the magnetic connection in the Venusian induced magnetosphere during events when the electron spectrometer (ELS/ASPERA-4) on Venus Express (VEX) has observed photoelectrons outside of the Venus dayside ionosphere. See Coates et al. (2008) for ionospheric photoelectron observations at Venus. We use the global HYB-Venus hybrid simulation (see Figure 1 upper panel) to model the Venus-solar wind interaction for the selected VEX orbits when these events have occurred. The upstream conditions in the simulation runs for the solar wind density and velocity are determined from the VEX/ASPERA-4 ion measurements and the upstream magnetic field is determined from the VEX/MAG magnetometer measurements (see, e.g., Jarvinen et al., 2009). Using the simulation solution we trace the magnetic connection to the orbit of the spacecraft. Further, we compare the intervals when the magnetic field connects the orbit and the Venus dayside ionosphere to the intervals when the ELS electron energy spectrum shows the signature of photoelectrons.

Lower panel of Figure 1 shows two parameters used in the study to determine the magnetic connectivity along the VEX orbit are defined. $hmin$ is the lowest altitude (from the planetary surface) of a field line connected to VEX. $SZA(hmin)$ is the solar-zenith angle of the $hmin$ point.

References

- [1] A.J. Coates et al., Planet. Space Sci. 56, 802–806, 2008.
- [2] Jarvinen R., Kallio E., Janhunen P., Barabash S., Zhang T.L., Pohjola V., Sillanpää I., Ann. Geophys. 27 (11), 4333-4348, 2009.

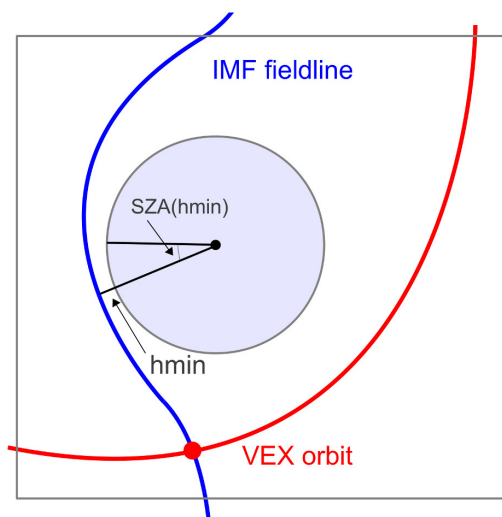
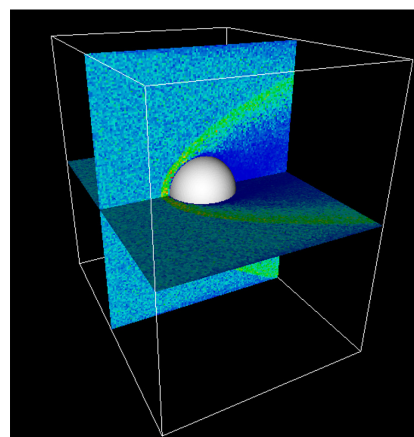


Figure 1: Upper panel: Example illustration of plasma density around Venus in the HYB-Venus simulation. Lower panel: Definitions of the $hmin$ and $SZA(hmin)$ parameters used to determine magnetic connection in the simulation.